

# Improving One Of The World's Oldest Inventions

University of Washington



## When is a toothbrush *nota* toothbrush?

When it's an ultrasonic device that propels thousands of tiny bubbles, pulsing at high speeds and providing a long-lasting feeling of clean.

In a feat of collaboration that involved medical physicists, periodontists, pediatric dentists and public health specialists at the University of Washington (UW), and a businessman known for a Midas touch with oral health care products, the device, now known as the Ultreo toothbrush, was born.

Like many great ideas, the brainchild hatched while its inventor was thinking of something else.

As a medical physicist, Pierre Mourad had spent much of his career considering the unlimited potential of ultrasound technology in medicine. These tools harness the energy of sound waves that have a frequency of greater than 15-20 kHz — above the range of human hearing.

While most of us know ultrasound as a way to view the inner workings of the human body, Mourad was looking beyond that. Fascinated by the mechanical aspects of bubbles, he had been considering how ultrasound might work with bubbles to help clean the mouth.

About the same time, Jack Gallagher, an angel investor, was invited to the UW Medical School on the Seattle campus. He had been asked to evaluate an investment in a novel ultrasound technique that would provide neurosurgeons with a minimally invasive means of measuring deadly swelling in the brain.

Mourad, also a research associate professor in the UW department of neurological surgery, had developed this brain

monitoring technique. Although Gallagher passed on the technology, he clicked with Mourad, and the two soon began exploring how they might use ultrasound waves to make a better toothbrush.

## Teamwork Leads to Great Results

With initial funding from Gallagher and other angel investors, and a boost from the Washington Technology Center, the new toothbrush was created. Mourad and his colleagues at the Applied Physics Lab conducted extensive development research and, with assistance from periodontists, pediatric dentists and public health specialists, tested his concept. The team, augmented with staff scientists, eventually garnered three research grants from the state and two from the National Institutes of Health, totaling almost \$2 million. Clinical studies ensued, proving the Ultreo toothbrush removed up to 95 percent of hard-to reach plaque in the very first minute of brushing.

“We wanted to employ ultrasound to create a toothbrush that was truly efficacious,” says Gallagher, former president of Optiva, the company that brought the Sonicare toothbrush to the world. “We had no idea if it would work — but if it did, it would be uniquely differentiated.”

## A Closer Look at the Toothbrush

In case you think the toothbrush you use now is adequate, Mourad, referring to published studies, says traditional brushes leave behind about 50 percent of the plaque that’s found on teeth. Plaque is the sticky film you can sometimes feel on your teeth between brushings, which can lead to the buildup of tartar. It’s literally a “biofilm” made of bacteria that can, over time, cause cavities and gum disease.

Numerous studies have shown a link between oral health and general health. The 2006 Surgeon General’s Report on Oral Health says gum disease may be a risk factor for health complications such as heart disease, diabetes and premature births. Gum disease has been correlated with a decrease in immune system efficiency and problems as serious as arteriosclerosis, a hardening of the arteries that causes cardiovascular disease.

Historians believe the first toothbrush was created in China more than 3,000 years ago, when someone plucked a few coarse bristles off a wild pig and tied them to a piece of bone to clean their teeth. Aside from the materials, the basic elements of the brush have remained the same over the years, and just recently the toothbrush was chosen as the one invention Americans could not live without according to the Lemelson-MIT Invention Index, beating out the automobile, the telephone and the computer.

## Ultero: The Next Wave in Dental Hygiene

The latest development in personal oral health care came about in 1959, when the power toothbrush was introduced and launched into the world marketplace the following year.

“More recently, companies have developed high-speed brushes that have been touted by consumer advocates, recommended by dentists, and endorsed by the American Dental Association.

And then came Ultero.

“While other power toothbrushes have high-speed bristle motion, they don’t have ultrasound,” says Gallagher. “Only Ultero has ultrasound waveguide technology.”

The key advantage of the Ultero over any other power toothbrush is its use of a patented “ultrasound waveguide” to

transform plain bubbles into bubbles pulsating with ultrasound energy.

According to Lisa Norton, licensing officer with UW TechTransfer, the ultrasound waveguide enables the ultrasound to activate the bubbles, causing them to pulsate and provide a long lasting feeling of clean.

First disclosed to UW TechTransfer in 2003 and licensed by Ultreo in 2004, the company now has seven U.S. and international patents and eight patents pending, proving the novelty of the instrument and its benefits over existing technologies. The company has attracted more than \$23 million in private investments, many from dentists and alumni of the UW dental school. The toothbrush, which costs around \$169, is sold at Sharper Image, and online retailers such as Amazon.com and Drugstore.com.

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